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Lavender tri colour & blue gene.

Dr Sheila M. Schmutz on her excellent website
http://homepage.usask.ca/~schmutz/dogcolors.html

Lavender "aka Isabella".

The Isabella gene is a recessive gene and it carries health concerns.

Dilated cardiomyopathy (DCM- always fatal), and alopecia autoimmune disorder where the dogs immune system attacks the hair follicles causing hair loss which is permanent) as well as other skin problems.

Being a recessive gene means it is "rare" so to get it more than once would mean inbreeding or breeding 2 dogs carrying the gene.

I wouldn't advise owners to run after the Isabella dogs.

Quick Links

The Dilution Gene
Breeds Carrying Dilution

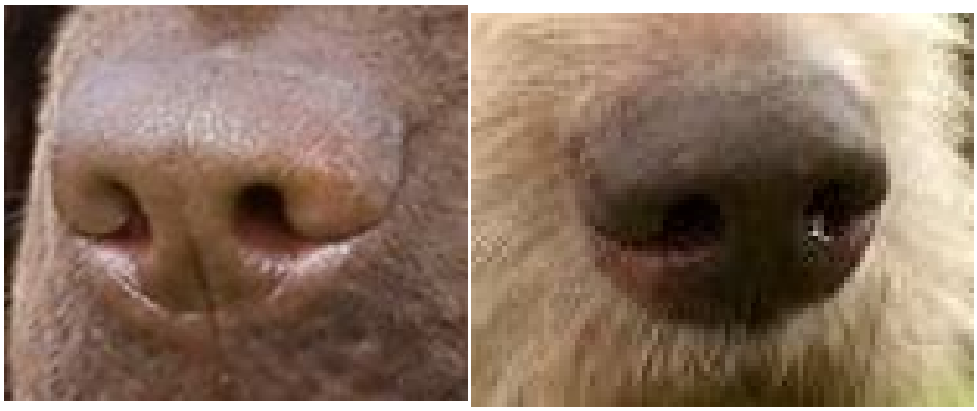
The dilution gene.

The dilution gene occurs on the **D** locus. It is recessive, so **d** is dilute and **D** is non-dilute, and in order for a dog to be dilute it must have the genotype **dd**.
A dog that is **Dd** or **DD** will have normal (non-dilute) pigment.
The dilution gene affects **eumelanin** (black and liver), although **phaeomelanin** (red) may be lightened as well.
When a dog has two copies of the d allele, a black dog will become **blue** (aka slate) and a liver (chocolate) dog becomes **isabella** (aka lilac).
A blue or isabella can have any coat pattern, but whatever they have, any black or liver in the coat will be turned to blue or isabella.
It is genetically impossible for a blue dog to have any black in its coat, or for an isabella to have liver.
The main giveaway that a dog is a dilute is generally its **nose colour**. The coat may be entirely sable or recessive red for example, but if the dog has a blue nose, it is genetically blue-pigmented.

Black nose (left) and blue nose (right).

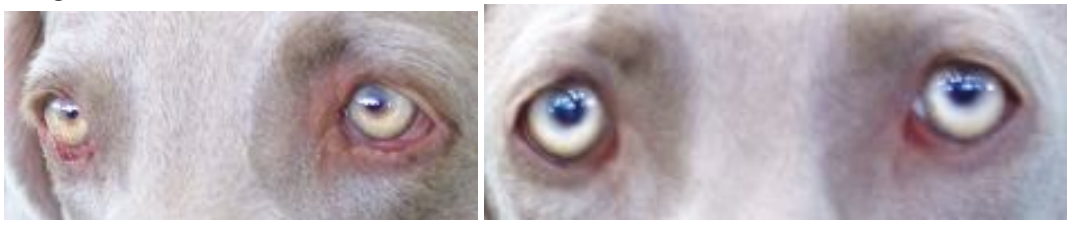
Isabella, however, is slightly trickier.

The dogs below show nicely-pigmented liver and isabella noses, but it's common for both colours to have very light, even pink, noses, and it is also common for isabellas to have darkish noses that look like liver.
It is therefore very difficult to tell a liver from an isabella unless there is some liver/isabella in the coat.



Liver nose (left) and isabella nose (right).
Most isabella noses aren't this dark, but they can be.

The dilution gene also causes the eyes to lighten to **amber**.
The colour is likely to be paler than the amber eyes seen on liver dogs.



Breeds carrying dilution.

Within most of these breeds, the blue gene is very rare.
Notable exceptions are the **Weimaraner** and **Slovakian Pointer**, which are the only breeds to come entirely in dilute and no other colour.
The dilute gene is also notably common in Italian Greyhounds, Whippets, Tibetan Mastiffs and Neapolitan Mastiffs - and of course in mutts and breeding different breeds together.
Dilution seems to occur from time to time in most breeds of dog – realize most breeds are a combination from various breed and dogs creating the breed in the first place.

It's unclear whether this is because it's a common mutation or because it occurred very early in the domestication of the dog (or both!).
It certainly seems to occur in most (if not all) breed types.

Dilution and health.

It's often claimed that dilute dogs are less healthy than those with normal pigment.
This misconception has most likely come from the prevalence in some breeds of a condition known as **Colour Dilution**

Alopecia (CDA).

Colour Dilution Alopecia is in fact the result of a **faulty** version of the d allele, known as **d^{l}**.
Not all breeds carry this faulty allele, and the majority of blues and isabellas are completely healthy.
See the **Health Problems** page for more information on CDA.

Blue (dilute black).

Black dogs become blue when they are **dd** on the D locus.
Blues can range from silver to almost black, and it can be difficult to tell a blue from a black by just looking at photographs.
However, when the dog is actually examined, it should be obvious that the nose is blue.
Brindle stripes, tipping on a sable, masks, black patches on merles, saddles, patches on a black piebald, and the black on a tan-pointed dog will all be turned to blue when a dog has the dilution gene.
Any and all black on the dog is included.
Sable tipping and merle patches may become difficult to see when they're diluted.
The dogs below show blue in various patterns.
I won't explain the patterns here as they're dealt with on their own pages, but hover your mouse over the photos to see a description of their colour.

Note the fairly pale red (phaeomelanin) areas on some of these dogs. Dilution does affect phaeomelanin but not to the same extent as it affects eumelanin.









Isabella (Dilute Liver)

The same dilution gene that causes a black dog to become blue also causes a liver dog to become isabella (aka **lilac**), which is a pale greyish brown.

Dilution and liver are both recessive and relatively rare, so isabella is a rarely seen colour.

It is, however, the colour of the Weimaraner, and also occurs occasionally in a handful of other breeds (any of the breeds in the list above which carry liver will come in isabella, although if both liver and dilution are rare in the breed anyway then isabella dogs may be barely known or even never reported).

An isabella dog will have the genotype **bbdd** (homozygous for liver, homozygous for dilution).

The photos below show isabella dogs.


The first isabella Border Collie photo above is by Cat of Dog Rad Design, and the second shows the beautiful Star and was submitted by Deborah Crease.


First photo by Sarah Elizabeth Adams, second photo submitted by Dr Anna Laukner

Isabella can occur in any pattern, as these two **tan-pointed** (a^ta^t) dogs show.

Dilute look-a-likes.

There are a few genes that can cause a dog to display a greyish colour when in fact they're not blue-pigmented or isabella, but black or liver.

Merle gives a bluish base coat, and the **greying gene** can also turn a dog **grey.**
The sure-fire way to tell a black from a blue is to look at the **nose**.
If the dog looks blue but has a black nose, it is in fact black with the greying gene.
This gene exists in Bearded Collies, Polish Lowland Sheepdogs, Bedlington Terriers, Old English Sheepdogs, Kerry Blue Terriers, Dandie Dinmonts and a few other long- or curly-coated breeds.
Greying can also affect liver, so a liver dog could appear to be isabella.
True dilutes are sometimes known as **"born blues"**.
This is because the dog will display the blue colour from birth, whereas a dog with greying will be born black (or liver) and fade as the coat grows.
The following dogs are not actually blues.

Quick Summary!

No time to read the whole thing? Here's the quick version!

The **D locus** controls the **intensity of eumelanin** in the coat (and also the eyes/nose/etc). There are just two known alleles - **D** and **d** (although there may be a number of different **d**alleles that are phenotypically the same - see the "Health Problems" page).

Eumelanin dilution is **recessive**, so D is non-dilute and d is dilute.

Only a dd dog will actually be a dilute, and a **Dd** dog will be a **carrier**.

This means that a dilute puppy can be born from two non-dilute parents.

All eumelanin is affected on a dd dog.

If the dog has any black or liver then it is **not a true dilute**. Generally the most failsafe way to tell a blue is by looking at the **nose**.

dd also affects liver as well as black.

A liver dilute is a **light grey/brown** and is generally known as an **isabella** or **lilac**. This is the colour of the Weimaraner.

Further info and links.

The gene causing dilution in dogs is known as **MLPH (Melanophilin)**.

It causes problems with the transportation of pigment along the hair shafts, resulting in the pigment molecules **"clumping together** "instead of spreading out as they should do.

MLPH causes dilution in a number of different species, including rats, mice, cats and humans, and the alleles causing this dilution are always **recessive**.

Some studies have suggested that there may be additional causes of dilution in dogs, not related to MLPH, but these genes have not yet been identified. It certainly seems to be the case that some dilute dogs test as DD (French Bulldogs are one notable example). A potential candidate for non-MLPH dilution in dogs is **TYRP2**, which is known to cause some forms of dilution in mice, and the phenotype of these mice is certainly similar to the darker shades of blue in dogs.

Links to studies:

MLPH Genotype - Melanin Phenotype Correlation in Dilute Dogs: **http://jhered.oxfordjournals.org/content/100/suppl_1/S75.full**

Polymorphisms within the canine MLPH gene are associated with dilute coat

color in dogs: **http://www.biomedcentral.com/1471-2156/6/34**